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ABSTRACT

As part of a project that investigated the teaching and learning of specific subject matters, three studies of geographic literacy were conducted. The purpose of the first study was to gauge the demand for geographic knowledge placed on adults in U.S. society by coding and analyzing geographic knowledge in The New York Times. To begin to assess the opportunities for acquiring this knowledge base, two other studies were conducted at the upper elementary school level. Data on teachers' geography goal statements made during interviews and on textbooks' treatments of a specific geography topic also were coded and analyzed for geographic content. The alignment of results from these three sites of geographic literacy yielded recommendations for both geography curriculum design and future research in this area. A 43-item list of references is included, as are two appendices containing information utilized in the study and data generated by the analysis of interviews and materials. (DB)

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Where is Geography? Three Studies of Thinking and Teaching

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Technical Report No. CLIP-90-04

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Classroom Learning and Instruction Project (CLIP)

Technical Report Series

The Classroom Learning and Instruction Project (CLIP) reports consist of a series of technical reports describing a program of research at the Learning Research and Development Center, University of Pittsburgh. This research is supported by a number of private and public non-military agencies and is under the general direction of Gaea Leinhardt. The theme of the research included in this series is the relationship between teaching and learning in particular subject-matter areas, such as mathematics and history. Some papers focus on teachers and how their understanding of specific content (e.g., graphing functions) impacts on their teaching; some papers focus on new assessment instruments that are attempting to measure the complexity of the interrelationship between content knowledge and pedagogy; others focus on the students and how their learning is influenced by their own prior knowledge in a content area and by the teacher's instruction. It is hoped that the cumulative findings of these studies will contribute to our understanding of learning and teaching. Particularly they will contribute to those aspects that are unique to particular topics and may in turn enrich our understanding of the field of teaching and learning as a whole. A list of CLIP reports appear at the end of this report.

Abstract

As part of a project that investigates the teaching and learning of specific subject matters, three studies of geographic literacy were conducted. The purpose of the first study was to gauge the demand for geographic knowledge placed on adults in our society today by coding and analyzing geographic references in *The New York Times*. To begin to assess the opportunities for acquiring this knowledge base, two other studies were conducted at the upper elementary school level. Data on teachers' geography goal statements made during interviews and on textbooks' treatment of a specific geography topic were also coded and analyzed for geographic content. The alignment of results from these three sites of geographic literacy yielded recommendations for both geography curriculum design and future research in this area.

Where is Geography? Three Studies of Thinking and Teaching

Teaching a subject matter that has long been neglected in the curriculum is problematic for a variety of reasons. For one, there may not be a consensus about what topics belong to the subject matter. For another, teachers may not know how best to teach the topics. A timely example of this dilemma is geography, which has largely disappeared from the curricula of American elementary schools, although it has continued to be taught in elementary schools of other nations. The question is: When direct formal instruction in the subject is deleted from the curriculum--under the assumption that sufficient knowledge about the discipline is acquired from the studies of other subjects, in this case, science and social studies--do students acquire a cohesive enough picture of geography to be geographically literate? In the largest international survey of geographical knowledge ever carried out, commissioned by the National Geographic Society and conducted by the Gallup Organization in the spring of 1988, American adults ranked in the bottom third of all subjects from around the world and our young adults, aged 18-20, ranked last (Helgren, 1990). And yet we live in a nation exerting great influence all over the globe, and, on a daily basis, are inundated by the mass media by information about far-off places and complex issues about which geography has something to say.

The issues of what geographic topics to teach and how they should be taught have become areas of discussion in the social studies community. One group, GENIP (the Geographic Education National Implementation Project), has published recently-developed curriculum guides which identify the objectives of geographic teaching for all grade levels, K-12. The elementary Guidelines were published in 1987 and the secondary Guidelines in 1989 (GENIP, 1987, 1989). Although they are in general use in those few schools which are currently teaching geography, this has not given them wide usage. In addition, little empirical evidence

has as yet been gathered as to their effectiveness. Furthermore, no major standardized test in the early years of schooling calls for anything in geography beyond simple map-reading.

Our research is an attempt to understand by induction what a reasonable scope of geographical literacy is and what the task of acquiring such literacy might require. The objectives of this research are threefold: a) to identify some of the kinds of geographic competence required of an educated adult in society today, b) to identify a set of objectives for geographic education as specified by teachers and c) to analyze social studies texts from the upper elementary school level in terms of the match between them and the competencies demanded of adults. By analyzing the nature of categories of geographic references found in *The New York Times* we identify elements of geography with which people must be able to reason in order to understand geographic information in the news. We identify educational objectives by analyzing the teacher goals revealed in interviews with current and former geography teachers of varying levels of experience and expertise. We analyze textbooks by mapping the categories of geographic knowledge used in particular text passages onto those from *The New York Times*, and those identified by teachers.

Related Research

The historical roots of geography can be traced for thousands of years by referring to the history of cartography. It is thought that primitive maps were first made by sketching on the ground physical features of the environment. "The first known artifact with a map on it is made of bone at what now is Mezhirich, USSR; it appears to show the region immediately around the site at which it was found" (Hellemans & Bunch, 1988, p. 35). The oldest known map of a city is a clay tablet from Mesopotamia, believed to be at least 4,000 years old. The Greeks, who invented the system of longitude and latitude still used today, brought a scientific, systematic methodology to cartography. Later the Romans utilized this science to help them in the practical problem of managing their vast empire. They produced maps for travelers and for

administrative purposes. In the East, the Chinese were also active geographers and cartographers. In fact, they printed their first maps roughly 300 years before maps were printed in Europe. After the fall of the Roman Empire, Arab scientists and scholars kept alive an interest in scientific map-making. European global navigation and world exploration, beginning in the fifteenth century, greatly increased the demand for map-making. Advances in various technologies have continued to drive map-making, up to and including the satellite and remote-sensing imagery used by today's cartographers.

In spite of this long history, geography was de-emphasized in most elementary curricula in this country beginning in the 1920s. It was believed that an integrated social studies curriculum would better answer the needs of American students. This is the current position, espoused by Savage and Armstrong (1987): "The important thing is not that the youngsters are studying a topic called history or geography, but that they are learning significant ideas about human beings" (p. 7). The argument was and is that the purpose of teaching geography is not to memorize place names and monsoon patterns but rather to have active knowledge ready for use in interpreting current events and historical phenomena.

Geographic educators agree with this statement of purpose, but they question whether such knowledge available for use in reasoning and in interpreting the world around them can be acquired by students without it being systematically taught. In fact, the absorption of geographic instruction into history and other social sciences has resulted in a serious undermining of American students' geographical knowledge base. There are at least two reasons for this deficit. First, geography as part of the social studies curriculum no longer has a cohesive knowledge base of its own; second, less real instructional time is devoted to it.

The content of the geography curriculum for the pre-college student is conceptualized here along two dimensions. One dimension is a system of spatial relationships about locations and distances gradually built up in students' cognitive structures, along with a sense of the degree of familiarity or unfamiliarity of each. The other dimension comprises the relationships between specific physical features and political, social, and economic structures. In some

sense, the first way of thinking about geography is a complex extension of an individual's own symbolic map of whatever place is familiar. For example, a person from San Francisco can understand a map of New York City because s/he has a "map" of her/his home territory firmly built into memory. In both places, the same kinds of questions can be asked about where things are in relationship to each other. Along with this spatial conceptualization is a notational system which standardizes point location, directionality, and distance estimation.

A substantial amount of research has been done on issues of spatial conceptualization and map use. In an article on the role of diagrams in reasoning and problem solving, Larkin and Simon (1987) showed that pictorial representations can sometimes convey information more rapidly and clearly than texts can--if a person knows how to "read" the picture. The efficiency of a diagram may result from the fact that salient features may be more readily recognized and inferences more directly made from a diagram than from text because the relevant information in a diagram is "at or near one locality to be accessed and processed simultaneously" (Larkin & Simon, 1987, p. 78). Several other studies have investigated the memory representation of large-scale environments from the information-processing point of view. Two studies provide evidence that geographic knowledge is organized hierarchically. Chase and Chi (1980) showed that the most serious errors in a map-drawing study were due to a normalizing error, which is symptomatic of hierarchical organization of information. Another study suggests that the errors that people make in judging relative geographical relations distort those relations according to their superordinate relationships (Stevens & Coupe, 1978). Siegal and White (1975) show that there is a strong parallel between children's acquisition of spatial competence and adults' acquisition of the spatial structure of a new environment. Chase (1983) studied expert and novice taxi drivers and found that representations of a large-scale environment may not be map-like, as Tolman (1948) had postulated. Chase found evidence of hierarchical ordering of information and surmised that the processes which operate on the mental representations are intrinsic to spatial thinking. Liben and Downs have researched children's developing mastery of "the representational and geometric correspondences that link

the map to its referent in the world" (Liben & Downs, 1989, p. 197). They present evidence to show three separate components of map skill (map conceptualization, map identification, and map utilization) which develop in tandem with other representational and spatial skills.

The second way of thinking about geography at the pre-college level emphasizes the political and economic relationships which exist because of particular physical features in a given place. This is geography from the point of view of the location of geographical entities and the ways in which they are in ethnocultural relationship to us. In the Stevens and Coupe study (1978), people made geographical inferences based on superordinate relationships primarily of a political nature. Both Saarinen's (1987) study of the centering of mental maps of the world and Hammond, Han, and Siraj (1988) investigated the way in which ethnographic factors influenced geographic perception. The representation of geographic knowledge of a non-spatial nature in long-term memory is at the heart of this second way of analyzing geographic information.

Both of these strands within the geography curriculum create schematic structures in the long-term memory of students which aid text processing. As in other domains, certain geographic words or phrases can evoke an entire schema which speeds the processing of the rest of the information in a text. Bransford and Johnson (1972) show that theme-related words help create contexts which allow increased comprehension of text. Beck and Carpenter (1986) present evidence of how readers interact with texts in the construction of ongoing and updated linguistic and conceptual representations of the text material. Thus, understanding depends to a certain extent on what readers know before they read, which allows them to make the kind of inferences needed to make the text coherent. This is as true for geography as for other subjects.

Methodology

Data

Three data sources were used in this research: a sample composed of the National and International sections from several editions of *The New York Times*, a sample of social studies textbook passages from grades 5 to 7, and a set of interviews with four social studies teachers. Text analysis was used with both *The New York Times* and the social studies text passages. Protocol analysis was used with the teacher interviews. Each of the three data sources is described below.

The New York Times sample

The New York Times was chosen for analysis because it is read by many educated American adults (Pool, 1952). Therefore, it would seem to be a good indicator of the breadth and depth of the geographic knowledge required of a literate citizen. The analysis of *The New York Times* (1989) categorized the geographic references that occurred in articles in the International and National sections in a sample of five days: March 14, April 3, May 18, July 21, and September 6. Other sections of the newspaper were eliminated from consideration either because they focus on local New York news, which is less likely to be read by people in other parts of the country, or because analyzing text about business, sports and obituaries offered less opportunity for tracing geographic literacy and knowledge. In addition, the two sections chosen offer sufficient data for the analysis. Using the entire edition would be too costly in terms of time and labor.

A preliminary analysis of the April 3, 1989 edition helped to produce a coding scheme based on categories which were suggested by the data. This coding scheme was later revised to accommodate the references found in other editions under study and a coding manual was developed to standardize codes.

Textbook sample

The second source of data came from selected upper elementary social studies textbooks. The analysis of these textbooks looked at the conceptual alignment of one topic common to both the books and *The New York Times*. The textbook analysis paralleled that of the newspaper and the same coding categories were used. The particular textbooks chosen were among the top-selling social studies series used by schools all across the United States.[1] One purpose of the analysis was to see if the geographic competence required to read *The New York Times* could be acquired by students using one of these texts. Another purpose was to try to generate a set of objectives for geographic education, based on the geography strand of the textbook content. Since textbooks can influence what and how teachers teach, this is of crucial importance in investigating geographic literacy. The interaction of text and teacher is one powerful source of geographic information for a learner and creates the knowledge base that people later bring to their reading of *The New York Times*.

Teacher interviews

The third source of data was a set of open-ended interviews conducted with four teachers from two Rhode Island elementary schools. Three of the teachers have had extensive experience teaching geography at the middle school level and one of them has taught social studies for two years. The interviews, which lasted roughly an hour each, were designed to allow the teachers to express how they would use three geography skill lessons taken from *Geography Skills*, by

[1]To ensure anonymity, the names of the textbooks used in this study are embedded in a larger set of textbooks, listed below. Those textbooks that were actually used in the study are indicated in Table 4 and are identified only by a code letter. The full list of textbooks is presented here in alphabetical order: Ginn and Company, 1985; Harcourt, Brace, Jovanovich, 1988a,b; Heath and Company, 1985; Holt, Rinehart and Winston, 1988a,b; Houghton-Mifflin, 1985, 1990; Macmillan, 1985; Prentice-Hall, 1990; Scott-Foresman, 1983, 1986a,b; Silver-Burdett, 1984, 1985a,b; Steck-Vaughn, 1983.

James F. Silver (1988). (See Appendix A.) The subjects were asked to read the lesson materials and think out loud about how they would use them. The interviews were audio-taped and transcribed. Each protocol is approximately 40 pages.

Analysis

The New York Times sample

Our study of *The New York Times* showed that, on average, there were more than 1550 references to places and geographic concepts in the International and National sections of each day's edition of the paper in our sample. Since the sample consisted of five days selected over a span of seven months, there was relatively little overlap in news coverage. From the approximately 7800 references found in the papers, eleven mutually exclusive and exhaustive categories of geographic references emerged. These categories were further subdivided in order to better understand their structure and to provide a finer-grained look at the content presented in the news stories.

An initial coding manual was written and tested, to accommodate the data from one edition of the paper. The manual was later revised based on the references found in other editions of the paper. The finalized coding scheme was taught to another researcher who helped with identifying and coding the data. Each piece of geographic data was identified, copied onto coding sheets, and then entered in a computerized database. The Hypercard software program was used to organize and sort it. Coding each page of *The New York Times* took about twelve hours. There were approximately 60 pages. Intercoder reliability, estimated by percent agreement, averaged 93%. Any discrepancies about coding were resolved by discussion and collaboration between the coders.

The analysis of *The New York Times* data was designed to describe and measure the use of geographic references in the newspaper. The extent of geographic knowledge needed by the

readers of the paper could be inferred from this analysis. A brief description of each of the eleven categories follows.

Personifications of place names are references to specific geopolitical locations to which have been attributed human qualities or characteristics. More will be said about this category later on. The **cardinal directions** category lists every mention of a direction as it relates to the places being discussed in the news article. This information is very useful to establish spatial relations between places named in the news. While this may seem trivial, it turns out that many more references are made to North than to South and to West than to East, particularly when the reference is used as a label for countries grouped by economic systems. This suggests that the reader must have two schemas: one for directionality and one for the connotations, in our culture, of Western versus Eastern. The **statistics** category contains a variety of disparate measurements that include distance, population, percentages, and rankings along several dimensions. The **geographic terms as part of an organization name** category are references in which a place name has been abstracted from its original use in context and made part of a title. This suggests that geographic terms can acquire meanings depending on context. **Datelines** are a text feature unique to newspapers, indicating where a news story took place. In this study, datelines were coded to reveal whether or not the city mentioned is tagged with its superordinate geopolitical unit. The **physical geography** references in the news included all references to natural phenomena (e.g., weather and climate; air, land, or water; plants and animals) as well as to human-made physical features of the environment (such as canals, lakes or hills). Physical geography references were seldom mentioned independent of economic issues. **Geopolitical** references are those that name particular places on earth. As would be expected, these were the most numerous references in the news. Consequently, there are four categories which sort these references: **specific geopolitical adjectives**, **generic geopolitical adjectives**, **specific geopolitical nouns**, and **generic geopolitical nouns**. "France" and "French" are examples of **specific geopolitical** references; "country" and "global" are examples of **generic geopolitical**

references. The last category is **maps**. It includes any symbolic representation of a place meant to help locate it or to give the reader information about spatial relationships.

Textbook Sample

For the purposes of this study, we chose some of the top-selling upper elementary social studies textbook series in use today for grades 5 through 7. One textbook topiç, which corresponded to a particular story reported in the news, was chosen for analysis. The topic was the Bering Strait and the story, reported in *The New York Times* on January 10, 1990 (Shabecoff, 1990), concerned a proposed international park to be located in Siberia and Alaska on both sides of the Bering Strait. The main purpose of the proposed park is to preserve the heritage of native (Inuit) people, living on both sides of the strait. A second purpose is to provide reciprocal access for the Inuit to their traditional hunting and fishing grounds and to tribal gatherings. Their tribal life was disrupted by the establishment of the geopolitical border between Siberia and Alaska, which separated members of the tribe who lived on opposite sides of the Bering Strait. The article about the park was coded using the system already described.

The methodology developed for the analysis of data in *The New York Times* 5-day sample was used for two further analyses: one of the Bering Strait article and one of sections of text from the textbooks intended to teach students about the Bering Strait. All textbook passages that mentioned the Bering Strait were selected for analysis by using the books' indexes to locate every reference. In some cases, references to the Bering Strait were scattered through more than one chapter. The Bering Strait article analysis resulted in the compilation of a list of some elements of geographic knowledge that readers would need to know in order to comprehend the article. The degree of alignment between the geographic competence potentially generated by information in the textbook passages and the geographic competence required to comprehend the Bering Strait article was then revealed.

One issue of interest in this part of the analysis is the relative grain size of content presented in the two types of text. The grain size of content in textbooks is driven by the requirements of the curriculum. Because textbooks are more concerned with global phenomena (which transcend political boundary systems) and their historical developments, the coding system used for *The New York Times* did not perfectly accommodate all of the kinds of references found in the textbooks. In one textbook passage, for example, North and South America were referred to as "the Americas," a reference which never occurred in our samples from *The New York Times*. Thus, the coding scheme lacked an efficient and accurate way of coding such references. Hybrid codes, which gave two or more specific geopolitical location code numbers, were introduced at this point. It was because of the ambiguity of these hybrid codes that intercoder reliability was reduced from 93% to 84%.

Teacher interviews

Interviews with four teachers were conducted in the spring of 1989. They were designed to elicit teacher planning statements about three prepared geography lessons taken from James Silver's Geography Skills (1988). The subjects were asked to read the lesson materials and were then asked to think aloud about what content the lessons were trying to teach, how it was presented, and how the subjects would modify these lessons in their own classes. The interview sessions, which lasted approximately one hour each, were audiotaped and later transcribed. The resulting protocols were analyzed to determine the kinds of goals the subjects perceived as being important for geographic education. Each line of protocol was examined to determine whether it contained goal statements. In all, 23 kinds of goal statements were identified. Each kind of goal statement was categorized as belonging to one of three areas: general pedagogical principles, geographic pedagogy, and geographic content. Counts were made of each kind of goal statement for each teacher. These counts were converted to percents.

The next task was to examine the goals which emerged from the interviews and to look at how well these goals for teaching geographic knowledge correlate with the kinds of geographic

knowledge needed by readers of *The New York Times*. This part of the analysis was designed to discover whether the goals outlined by the teachers could lead students to acquire the kind of geographic literacy needed in order to be able to read and comprehend the newspaper.

Results and Discussion

The New York Times sample

The geographic references we identified in the International and National sections of *The New York Times* created a database with 11 different categories. The percent of references in each category was computed and the results are shown on Table 1.

Insert Table 1 here

Table 1 shows a summary of cumulative geographic references in *The New York Times* database. The left column contains a list of the eleven categories into which the geographic references were sorted. The right column gives the percent of the total number of references for that category. Here, as in all subsequent tables, values were rounded to the nearest tenth of a percent.

Although the database is very rich, constraints of time and space preclude a full discussion of all findings. However, in the analysis of data, four topics of particular interest emerged and are discussed below.

Specific Place Names. One topic of interest is the set of five categories that involve specific place names. Together these categories have the highest frequency of occurrence in the data (see Table 2). Preliminary results suggest that knowledge of place names is a most

important piece of geographic information that readers must have in order to make sense of the news. In fact, more than 60% of all the geographic references in this database concerned specific place name location. In Table 2, the left column lists the categories that consist of references to specific place names. The right column gives the percent of instances of each category for all five days of the sample.

Insert Table 2 here

Clearly, to understand *The New York Times*, readers must be able to both recognize specific place names found in news stories and access stored information about those places. If a place name is unfamiliar, readers must be able to reason from something they do recognize or can access quickly in order to construct meaning for tne place they do not immediately recognize. The crucial factor is that information about place names must be connected in the mind of the reader to other important pieces of geographic knowledge and not remain disembodied place name knowledge. The place names must be able to be used in a relational way with salient points in the rest of the article.

Generic Place Names. The second topic in this discussion is that of geopolitical entities that are referred to generically in the newspaper. One of the findings in this study is that generic geopolitical references tended to be used in a somewhat flexible way. Journalistic style often constrains the language used by news reporters in describing geographical entities, both physical and geopolitical. In order to make a news story interesting to the reader, vocabulary is sometimes varied, even at the expense of accuracy. Terms are used as synonymous when they are not definitionally equivalent in order to add a certain vividness and freshness to the prose.

This is particularly true in longer articles, where a certain word may otherwise be used *ad nauseam*. In addition, there are some geopolitical realities which are in themselves ambiguous. For example, a news article may refer to Lithuania as being both a **country** and a **republic** within the U.S.S.R. This ambiguity stems from the fact that the Soviet Union is a confederation of republics, which at one time were separate nations. This usage also reflects the lack of clarity in U.S. foreign policy as regards Lithuania: the United States government has neither recognized the Soviet annexation of Lithuania, nor supported Lithuania's moves towards independence. "Country" and "republic" are not necessarily synonymous, but in this article they are used as though they were. Thus, in order to process such terms, competent readers need both an accurate knowledge base and an ability to be flexible.

Personification of place names. The third topic for discussion is the attribution of human characteristics to places. More than ten percent of the geographical references from *The New York Times* database are personifications of place names. Readers must have acquired a schema for the personification of inanimate objects in such a way that they are prepared to interpret place names treated this way. Although such journalistic writing techniques undoubtedly make for more vivid and interesting text, they are a potential source of confusion for the inexperienced or unwary reader. Readers must have the ability to tag such personifications, realizing that skepticism is called for in evaluating the often propagandistic element of the reference. Such skepticism is necessary in light of the fact that personifying a country or city results in creating the impression that there exists in that place a single homogeneous population with uniform behavior, goals, and intentions.

Preliminary content analysis of this category suggests that these references can be coded according to three classes: those with positive, negative, or neutral attributes. Of these, 42.7% were positive and 36.8% were negative. Examples of positive personifications of place names include "Honduras has been eager" (p. 1, col. 6, March 14, 1989) and "China has a long history of respect for scholars" (p. 6, col. 6, May 18, 1989). Examples of negative

personifications include "Miami takes a perverse delight" (p. 8, col. 2, May 18, 1989) and "Budapest Avoids Responsibility" (p. 8, col. 1, September 6, 1989). Further research will need to examine these issues more closely, especially in terms of which countries are systematically treated in a way that might over time bias the reader.

Maps. The fourth and final topic to be discussed in this section concerns maps. Maps constitute only a tiny proportion of the references in the study, 0.3%. Maps were coded as single references in the same way that single words were considered; however, they are not comparable either in terms of function or in terms of importance. Functionally, a map carries many "bits" of information which support the content of the news story and aid the reader in comprehending the situation in which the news takes place. Readers who cannot comprehend information on a map by activating a well-developed map schema are at a disadvantage. Readers who are able to use maps as tools for comprehension and reasoning not only are given support in their construction of meaning from the newspaper article, but they are also able to learn, to acquire new knowledge from the map in the paper.

Maps in *The New York Times* maximize use of conventions and minimize the amount of orienting information. All the maps found in our sample of *The New York Times* papers were examined and analyzed to determine their characteristics. A list of symbols and map elements used on our sample maps is found on Table 3.

Insert Table 3 here

These elements are all familiar to readers who already have a well-developed map schema in long term memory. However, some of these elements are variations of the standard conventions used on other kinds of maps. This usage of variations in map conventions requires the reader to be flexible in reasoning with a map. For example, in looking at a map in *The New York Times*, readers must assume that up is north. They are also expected to be able to

distinguish land from water and mountain ranges from flat land, where relief is indicated pictorially, without an explicit key for such information. In addition, it is assumed that readers are familiar with the use of dots for cities and the use of solid lines to delineate undisputed geopolitical borders. This means that to read and properly interpret *The New York Times* maps, an adequate and stereotypical map schema must already exist in the minds of the readers, ready to be activated by the kinds of maps that appear in the paper.

As is true for most kinds of maps, the maps found in *The New York Times* require multiple eye fixations to read. This is in contrast to the text processing of words, in which many familiar or high-usage words can be identified and processed in a single glance (Carpenter & Just, 1986). Hence, a reader with a well-developed map schema, who glances at the map provided to supplement the article, will very likely spend much more time on it than on single words. This information is not retrievable from the coding scheme used with the data: maps and words were each counted as single instances of a geographic reference. Thus, while maps were few in number in *The New York Times*, their value in supporting the content of an article is considerable.

In summary, this initial analysis of the *New York Times* database provides some understanding of the breadth and depth of the geographic knowledge base needed by readers in order to construct meaning from the paper's presentation of the news. On the one hand, well-connected specific place names are central to this knowledge base. On the other, flexibility is required to be able to interpret instances of generic and personified place name use. Flexibility is also called for in order to read and interpret the "house style" of maps found in the *New York Times*. Understanding where people acquire the complex of factual knowledge and flexible use of that knowledge is a major focus for the remainder of this paper.

Textbook sample

The textbook passage analysis was done following the same methodology as the analysis for *The New York Times*. Thus, these results are reported in much the same way as in the previous section. Table 4 offers a summary of the data from the textbooks.

Insert Table 4 here

Some of the categories of references found in *The New York Times* are not present in the textbook passages. For example, there are no datelines in textbooks. Also noteworthy is the fact that in our sample, the textbooks used very few place names in organization titles and no generic geopolitical adjectives. Even when a geographical term from the textbook sample fit into an existing category of reference, the meaning attached to that term was different there than its meaning when it occurred in the newspaper. For example, when a textbook uses the term Europe, the term refers to a geographic entity--a large land mass with certain characteristics--whereas a newspaper article's use of the term usually implies a geopolitical concept--a specific set of countries. When textbooks do make references to countries, the references are meant to call up schemas in which physical geography is of primary importance. Newspaper references to the same countries are meant to call up political-cultural schemas, in which the physical geography is of much less importance.

In contrast to the textbooks, *The New York Times* rarely used generic names for large land masses (e.g., continent, plain). The pattern that emerged from the data showed that specific names were given in an article, often beginning with larger, more global labels and moving toward fine-grained, local place names. The coding scheme reflected this structure, having extremely fine-grained categories and codes for specific geopolitical locations and rather coarse-grained categories and codes for references of a more generic nature. A possible explanation of this is that the newspaper focuses on very local, fine-grained issues of current

interest and the textbooks focus on broader, more general concepts. Ideally, these broader concepts should help a learner form the geographic basis for understanding a newspaper article about a current, highly localized, specific situation.

The contrast between the grain size of information in the newspaper and that in the texts is related to a tension in the educational community today. On the one hand, there is a commitment to teach deep, generalizable principles which can then be accessed for specific purposes and for solving specific problems (Ohlsson, 1990). On the other hand, there are decided advantages in grounding information in specific situations, because of the natural coherence found within such situations (Brown, Collins, & Duguid, 1988).

According to schema theory, knowledge is organized in the long term memory of each individual in the form of general knowledge structures (Anderson & Pearson, 1984). In the course of this study, it was found that the function of the geographic references in the textbooks differs from their function in the newspaper. The textbooks are designed to build up within students schemas for comprehending basic geographic entities. The newspaper is designed to elaborate upon these basic schemas and to modify them in response to current events. For example, one in ten *New York Times* references was to a physical geography feature. In the textbook, however, a much larger percent of references belonged in this category. In fact, there were nearly three times as many physical geography references in the texts as in the newspaper. In addition to the relative density of these references in textbooks, the textbooks referred to a far greater variety of physical features of the environment, such as forests, glaciers, and grassy plains. We found that *The New York Times* coding category for physical features was not appropriately subdivided for use in coding textbook references, given the greater breadth and depth of the references in the textbook passages to physical features of the environment. Furthermore, the physical geography references were not as important in the newspaper, where, ostensibly, the primary purpose is to inform the public about the geopolitical changes at work in the world today. In the textbooks, on the other hand, the purpose was to build up schemas for organizing basic information globally, rather than geopolitically.

These schemas become basic structures of information in the minds of students; schemas can then be elaborated upon and modified in response to reading about current events from the newspaper.

Table 5 compares the results of the coding for geographic references found in three separate sources: the textbook passages (taken from the averaged data reported in the rightmost column of Table 4); the single *New York Times* article on the proposed international park near the Bering Strait; and the original, five-day *New York Times* sample (reported in Table 1).

Insert Table 5 here

Many interesting points of comparison among the samples can be seen from this table. The first is the huge discrepancy in the use of personifications of place names between the textbook passages and the newspaper articles. Whereas both newspaper data sets have approximately 10% of their references classified as personifications of place names, less than 2% of the textbook passage references fit this description. Another large discrepancy is in the category of geographical terms as part of organization titles. There was only one such reference in our textbook sample, while such references were relatively common in the newspaper. As discussed above, one of the most significant difference between the two types of text was found in the physical geography category. The textbooks contained nearly three times as many physical geography references. The proportion of maps to text was also heavily weighted on the side of the textbooks. This is not unexpected, since the textbooks are designed to build up in students the very map schemas which they will later need to access in order to be able to read the maps in the newspaper.

The three samples described in Table 5 are not, of course, of identical size. The first sample consisted of approximately 15 pages of textbook passages that contained information

about the Bering Strait. The second sample consisted of 15 inches of 2 inch wide newspaper column. The third sample consisted of sixty pages of densely printed newspaper. Comparing numbers of pages is misleading, however, because, in addition to printed words, the textbook pages had numerous pictures, maps, and other illustrations, not to mention a much larger font size than was used in *The New York Times*.

This part of the research also revealed an interesting insight about maps in *The New York Times*. The article on the Bering Strait contained a particular map which could challenge a reader's conceptualizations that were formed by exposure to a limited range of map types and projections used in schools. The prototypical world maps used in this country place the Atlantic Ocean in the middle of the map, splitting the Pacific Ocean. This prevents students from acquiring an understanding of how close the Soviet Union is to Alaska, for example, or of how narrow the Bering Strait really is. In the article about the proposed international park, the accompanying map was centered on the Bering Strait and made very clear how close the two land masses really are. Looking at a map in which the Atlantic Ocean was split and the Pacific Ocean was whole gave the reader the opportunity to acquire a new perspective about the shape and relationship of land masses and bodies of water. Thus, maps in newspaper articles can allow readers to learn more about very small areas of the world with which they may not be familiar.

What we learn about the teaching of geography from the analysis of the textbook passages is that geographic information in the textbooks is heavily weighted on the side of physical geography. Geopolitical issues are much less important in the textbook passages and are treated differently than they are in the newspaper. In the textbooks, such geopolitical issues are presented as part of schemas of cultural geography meant to give students an understanding of human-environment interactions. In the newspaper, they are the means of modifying these schemas, which are presumably already in place.

Teacher interviews

The four teachers had experience ranging from two years of social studies teaching to more than 40 years of geography teaching. As could be predicted from the results of other studies that have contrasted novices and experts, the amount of experience in teaching geography was directly related to the types and the amounts of goal statements made in these protocols. Not only do experts have more goal statements than do novices, but also the organization of their goals is more intricate (Chi, Glaser, & Farr, 1988). The more experienced teachers, possessing deeper subject matter knowledge, were less likely to allow their lessons to be limited by the prepared text that served as the study stimulus. They clearly stated what they thought should be taught and they subordinated the objectives of the prepared lesson to the lesson goals that came from their individual sense of what geography is all about.

Twenty-three goals emerged from the protocols. Seven were general pedagogical goals, dealing with the following issues: coping with individual differences in prior knowledge, academic ability, or cultural background; keeping students interested in the lesson; structuring the lesson; taking into account the nature of learners; establishing objectives for a lesson; making evaluative statements about lessons or lesson components in the interests of preparing a better lesson; and making planning statements. Six goals were more geographical in orientation, although still primarily pedagogical in nature: choosing an appropriate representational tool or methodology for the lesson, teaching vocabulary, using comparison, using current events, using geography axioms as pedagogical methods, and expressing expectations for student mastery of material. Ten other goals were oriented toward specific content which the teachers considered most important for elementary students: map study, cultural geography, climate zones, vegetation, the physical geography of landforms, physical geography changes, import/export of agricultural and industrial products, animals, population, and regions.

Table 6 compares the four teachers' expression of these twenty-three goals. The leftmost column lists the teaching goals, organized into three categories. The first category is

composed of general pedagogical goals that do not necessarily have anything to do with geography. The second category contains goals that are specifically geographical although primarily pedagogical in nature. The third category is a set of goals that relate directly to specific geography content. The four teachers are listed across columns two through five. They are ordered according to the amount of teaching experience each has, from the least to the most. The numbers indicate the percent of all goal statements in a teacher's protocol that pertain to each goal.

Insert Table 6 here

The profile that emerged from this table is a striking picture of the difference that years of teaching in a subject matter can make. The number of goal statements about general teaching goals, which have nothing to do with geography *per se*, decreased as a function of teaching experience. Goal statements of pedagogy particular to the teaching of geography reflected a similar pattern in the data. However, the number of goal statements related directly to geographic content increased as a function of teaching experience. In other words, the teacher with the least amount of geography teaching experience was more concerned with the "how to teach" than the "what."

Since the analysis of the newspaper already indicated that maps were a particularly interesting kind of geographic reference, we felt justified in taking a closer look at the teacher goals that pertain specifically to the teaching of maps. One of the three skill lessons on which the interviews were based was a lesson on using longitude and latitude to establish absolute location. Knowledge of and facility in the use of the grid system of longitude and latitude is basic to much of map-reading and interpretation. Thus, all four of the teachers devoted significant emphasis to the teaching of map skills in their protocols. A composite list was created for all the map-related goals mentioned in the protocols. A summary of these goal statements appears on Table 7.

Insert Table 7 here

The list found on Table 7 organizes all of the teachers' map-related goal statements around three conceptual frameworks: location, latitude and longitude, and tools.

All the map-related goals found in each teacher protocol were counted and coded in hopes of identifying a set of "universal" goals, that were cited by each teacher. However, none of the four teachers included every single one of the map goals in her protocol. The amount of goals per protocol varied as a function of the amount of teaching experience the teacher had. Generally speaking, the more experience, the more goals, and the contrary is also true.

The objective of this analysis was to look at the alignment of the teachers' map-related goals and the demands for map skills made by the maps in our five-day sample of *The New York Times*. Table 3 listed the map elements found in the newspaper maps in our sample. Of those 18 map elements, only four are not part of the teacher map goals, in one form or another. This seems a high degree of consonance, given the randomness of the newspaper sample and the fact that the teacher interview stimulus materials were not chosen with this particular analysis in mind. The following four map elements were not specifically mentioned by teachers as being part of their goals in teaching about maps: abbreviation of country names, dotted borders to show disputed areas, ambiguous notation that might confuse mountain markings with border markings, and dateline cities represented by stars. The lack of perfect agreement between the set of map elements identified in *The New York Times* and the map-related goals mentioned by the teachers does not indicate a serious deficiency in geographic pedagogy, although there do appear to be some problems on the surface. Looking more closely at the first of these four map elements, it is clear that abbreviations of country names is a variation on the theme of abbreviated words, which students begin to learn in third grade. The second element, using a star to indicate the location of an unlabeled city where the news story happened, is a particular case of labeling cities, which is, in fact, mentioned as a teacher goal in the protocols. Thus, both

of these elements ask students to flexibly apply knowledge already learned. The third element, which involves the inability of a reader to distinguish between the method used to show relief and the symbol showing the border of a country, is an element that probably would not seriously interfere with using the map to supplement the news article. Editorial policy no doubt serves to limit the number of times that such an unfavorable optical coincidence occurs. Finally, although the dotted borders that indicate disputed areas might cause a reader some initial difficulty, data from our study does not allow us to draw conclusions about this issue.

A preliminary comparison of teacher goals and newspaper maps revealed that newspaper maps differ from the kinds of maps used in classrooms along several dimensions. First of all, because the newspaper maps are intended to call up already developed map schemas, they tend to be less detailed and to vary widely in the graphic presentation of information. Also, because their primary intent is to supplement a news story, the maps give emphasis to places that are featured in the news, regardless of the relative importance of the place in the overall scheme of geopolitical realities. Thus, very small towns may be labeled with very large letters or highlighted for emphasis and a capital city may have only a small marker to indicate its location. In addition, some newspaper maps (cartograms) are at such a large scale as to more resemble schematic plans. The symbols on these maps may not necessarily be part of an individual's map schema. (See Appendix B.)

This usage of variations in map conventions requires that the reader be able to use flexibility in reasoning with a map. Although there are clearly some map features that do not correspond specifically to the map-related goals mentioned by the teachers, there are no large gaps between the two lists. Thus, if a teacher were attending to all of the above goals, and if students actually mastered the materials presented by their teacher, the students would be in a good position to understand the maps found in *The New York Times*. The point is that we were able, from a sample of four social studies teachers with varying amounts of classroom experience, to pull together a set of map-related goals that, if pursued, do, in fact, have the

ability to prepare students to develop the kinds of map schemas that will be needed later on when they read *The New York Times*.

In terms of teaching geography, then, this research shows that teachers must be helped to adopt the kinds of goals that will permit students to build map schemas that are sufficiently developed to allow for flexible use under varying conditions. The comparison of the teachers' map-related goals and *The New York Times* maps has helped to answer the question of how one part of geographic literacy, using maps as tools for reasoning, is acquired.

Implications

The mis-match which exists in these three conceptualizations of geographic literacy is clearly an issue in education today. Just where is geography? In this study, geography was located in three places, each of which emphasizes a different aspect of what constitutes geographic knowledge. The passages in our textbook sample presented geographic information mainly about various issues of physical geography. The teachers' goals generally worked toward integrating information about physical geography with cultural geography and with the use of geography as a reasoning tool. The newspaper text emphasized the changing political realities of places around the world. Thus, reading the newspaper functions to refine schemas theoretically already in place in the readers' long-term memories. Having identified these aspects of geographic knowledge, let us turn to how geographic literacy is acquired.

This understanding of how geographic literacy is acquired is based on the idea that learning geography is a life-long process. Textbooks and teachers begin the process by introducing students to geographic information and elaborating on it, especially in terms of using geography as a reasoning tool. Initially, topics of physical geography are introduced, primarily by textbooks. These are then linked to elements of cultural geography considered particularly important by the classroom teachers. Eventually, students become readers of

newspapers, which modify and update readers' geographic schemas in response to current events.

The process of acquiring geographic literacy might break down in any of three places. The textbook presentation of geographic information is at risk of not becoming part of students' reasoning abilities. Teachers, even those who are well-trained and geographically literate themselves, may fail to provide enough support to students trying to reason with geographic knowledge. Finally, newspaper presentations of geographic places and concepts may demand a flexibility in reasoning which readers may not have developed. When the process of acquiring geographic literacy breaks down, a person is left with isolated bits of information about diverse physical and cultural phenomena. Geography is reduced to a category in a trivia game.

Flexibility in accessing and reasoning with geographic knowledge, necessary for reading and fully understanding the geographic references in the newspaper, is clearly one of the most important goals of geographic literacy. Demands for flexibility made by the newspaper occur in many contexts, three of which became evident in the course of this study. Flexibility is called for when place names are personified, because readers need to be able to know the extent to which they can trust a characterization of an entire nation or government when it has been reduced to one data point. Flexibility is also required in processing the generic geopolitical nouns and adjectives, some of which are used in ways not strictly in accord with their definitions. And finally, flexibility is needed in order to make sense of the kinds of idiosyncratic map symbols used in *The New York Times*. The link between the textbook presentations of geographic knowledge and the newspaper use of such knowledge is made by the teacher's ability to move students towards using geography as a reasoning tool. It is important for teachers to provide opportunities for students to develop flexibility in their use of the geographic knowledge they acquire and to do so in ways that will facilitate their later reading of text such as that found in *The New York Times*.

Having looked at how the three data sources conceptualize geographic literacy, it is evident that considerable mis-match among them exists. What is possibly most problematic are

the issues surrounding the use of place names. There is little overlap in the data, due, in part, to the huge number of place names with which educated adults are expected to be familiar. Teachers try to ground place name information in a network of knowledge about specific places which includes facts about weather and climate, indigenous animals and plants, and natural resources, as well as population and cultural geographic information. The textbook passages tend to present place names associated with more global geopolitical units. This emphasis may exacerbate student confusion about the names of smaller geopolitical units. The newspaper focus on specific places, which are used to define the location of current events rather than to relate the location to the larger context in which the place is located, may contribute to an individual having in memory vast amounts of unintegrated facts with which s/he cannot reason. When the reader has no basic schemas to organize the place name information from the news, it is likely that very little of it will be remembered at all. Furthermore, without any integrated knowledge of place names, a reader's capacity to reason with geographic information is severely limited. And since so little time is devoted to learning geography in our schools, this lack of reasoning ability seems all the more likely.

In terms of map usage and map skills, there did not seem to be a tremendous amount of mis-match among the three data sets. One implication of this finding is that the amount of overlap where maps are concerned may mean that the editors of *The New York Times* have good reason to believe that their readers are helped by the maps which accompany particular articles.

This research has looked at where geography is located and what geographic literacy is, using three contexts: what geography *The New York Times* requires adults in American society to know, where textbooks place their emphasis in communicating geographic information, and what geography teachers consider basic objectives of their teaching. This study attempted to compare the use of geographic knowledge in these three different contexts. Although some mismatches appeared, one should not necessarily conclude that specific, potentially useful ideas are not being taught. Rather, the mismatch suggests that areas where these discrepancies were

found provide only location where teachers or researchers should begin to look for problems in instructional adequacy. Those areas that have relatively comparable emphasis in the textbooks and the newspapers also may be areas that should be examined in more detail to be sure that the assumption of adequate coverage is warranted. These conclusions are based, of course, primarily on a coding structure that does not permit deep content analysis. The rich databases created by this research now need to be examined in a content-focussed way in order to begin to uncover the deep meaning of how geography is used and taught. Ultimately, this research hopes to inform those responsible for social studies/geography curriculum and textbook design so that they can address the current lack of geographic competence that is so generally acknowledged.

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Appendix A

Three Prepared Lessons Serving as the Stimulus

for Interviews with Four Geography Teachers*

* Taken from James Silver (1988). Geography Skills. West Nyack, NY: The Center for Applied Research in Education, a division of Simon and Schuster, Inc.

Basic Environments: How to Study a Geography Picture

Background

Geography is concerned with the physical environment and human interaction with it. Using this simple but basic definition, it is possible to set up a list of questions that have universal applicability and that both instructors and students may use to study photographs and drawings for geographic data and relationships.

Student Involvement

1. Instruct your students on how to scan pictures for information. Encourage them to make notations on the lines next to each item on the activity's checklist.

2. As an initial experience, the students can react to the picture on the activity page. Suggested elements for discussion are written on the checklist shown on this page.

3. In the future, students may use photocopied checklists, or refer to a wall chart that contains the appropriate listings.

Answers to the Exercise

1a. Cactus and brush growing wild
b. None in evidence
c. High bare mountains; plains with low hills
d. Flowing stream, apparently from the mountains
e. Sunny in foreground, cloudy in background
f. Warm to cool, as shown by crops and clothing

2a. Very little except for plowing and hoeing
b. Nothing (no irrigation ditches or man-made ponds)
c. Goats, chickens
d. Planted crops of corn and vegetables
e. Flat-roofed houses of mud, adobe
f. No roads evident; no poles nor wires
g. Full clothing indicating warm to cool weather; broad hat for the sun

3. Garden-type farming; appearance of dryness; general lack of natural vegetation

Name _____ Date _____

HOW TO STUDY A GEOGRAPHY PICTURE

FARMING IN HOT, DRY NORTHERN MEXICO: Mexican families work together to supply enough food. Corn is the important crop. The goats supply milk, which is made into cheese. This family is very lucky to have a stream on their property.

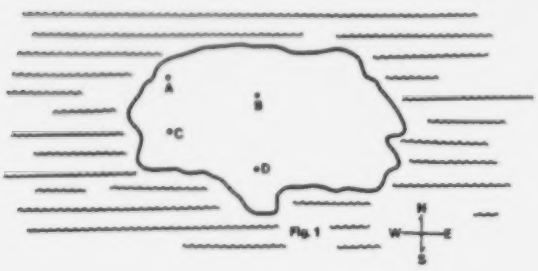
© 1988 by The Center for Applied Research in Education

1. What things does the picture show that were not made by people? Look at the
   a. plants: _____
   b. wildlife: _____
   c. land: _____
   d. water: _____
   e. weather: _____
   f. climate: _____
2. What things have people done to help them live in the area shown in the picture? Look at the
   a. land changes: _____
   b. water changes: _____
   c. animals: _____
   d. plants: _____
   e. houses and other buildings: _____
   f. aids to transportation and communication: _____
   g. clothing: _____
3. What are some other things that you notice in the picture? _____

More Reading and Interpreting Maps: Determining Direction with Latitude and Longitude

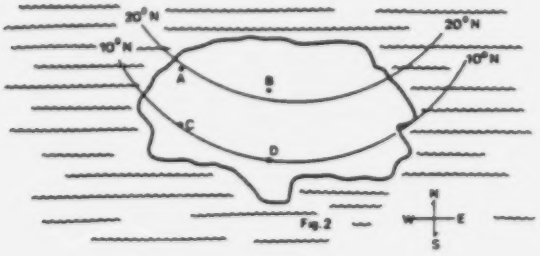
Background

1. Often, the apparent location of a place on a map can be deceiving. A place may appear to be farther north, south, east, or west of another place than it really is. Here is an example:



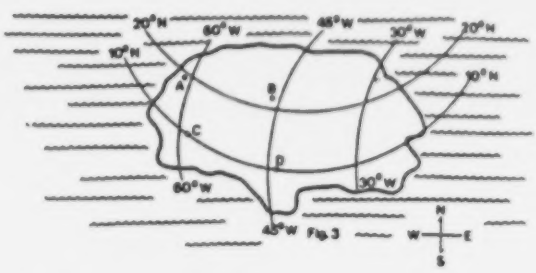
In Fig. 1 above, Point A appears to be farther north than B. And from the data on the map, one would be justified in coming to that conclusion.

2. However, when we impose lines of latitude on the map (Fig. 2), we see that B is farther north than A. We know this because B is north of the 20° N line of latitude and A is south of the 20° N line.



Similarly, C and D are both the same distance north of the equator, although C appears to be farther north.

3. Misperception of direction can also occur if longitude lines are not shown. It appears in Figs. 1 and 2 that A and C are equally west of the prime meridian. But when lines of longitude are drawn, as in Fig. 3, it is clear that A is approximately 61° W, while C is approximately 59° W. Likewise, B is farther west than D.



Student Involvement

1. Explain the foregoing to the extent that is appropriate for your class. Sketches and diagrams will add significantly to their understanding.

2. Illustrate the use of the grid as an indicator of true direction by showing a typical map of the United States on which its northern boundary, 49° N, is shown as curved. On a globe, that line would be perfectly straight.

3. Point out that on maps of small areas, direction is not significantly inaccurate if there are no lines of latitude and longitude, but on maps of large areas the grid is necessary for accuracy.

4. Have your students complete the exercise on the facing page.

Answers to the Exercise

1*a*. Ankara *b*. Cairo *c*. Durban

2. London, Accra

3. Aden

4. Naples, New York

5*a*. A *b*. D *c*. C

6*a*. A *b*. F *c*. C

7*a*. B *b*. B

Name _____ Date _____

DETERMINING DIRECTION WITH LATITUDE AND LONGITUDE

1. Leningrad is on the 30° E line of longitude. What three cities are almost directly south? a. _____

b. _____ c. _____

2. Oran is on the 0° line of longitude. What city is almost directly north?

_____

What city is almost directly south?

_____

3. What city is almost directly south of Baghdad on the 45° E line of longitude?

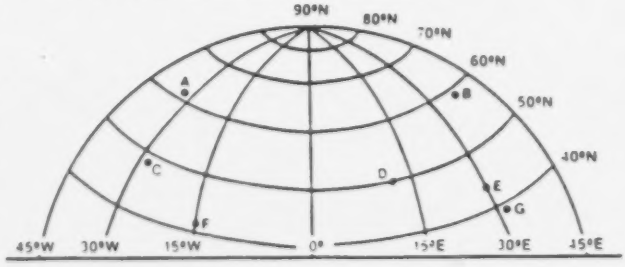
_____

4. Ankara is close to the 40° N line of latitude. What two cities are almost directly west? _____

_____

Note: Use the map at the bottom of this column to answer the following questions.

5. Which point is farthest north?
   a. A or B ____ b. C or D ____
   c. C or E ____
6. Which point is farthest west?
   a. A or C ____ b. F or D ____
   c. C or F ____
7. Which point is farthest east?
   a. D or B ____ b. B or G ____



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Statistical Information on World Population and Production: The World's Rice Bowls

Background

Wheat, rice, and corn are the three grain crops that are most important in feeding the world's ever-increasing population. Whether these crops are abundant or lean is largely dependent upon geography and climate.

Student Involvement

1. Before proceeding with the "bar graph building" activity on the facing page, it would be meaningful to point out on a map the rice-producing countries listed in the table. Arrive at the generalization that Asian countries dominate the production of rice.

2. It may be helpful to complete with the students Items 1 to 3 of the exercise. Then they should be able to complete Items 4 to 6 independently.

3. Item 6 calls for questions to be composed by the students. Have some of the questions read by the students and answered by others in the class. To help the class understand the kinds of questions they should ask, read to them the two sample questions that follow:

—"What percent of the world's rice did China grow?" (Thirty-eight percent.)

—"How much more rice did China grow than India?" (Twenty-one percent.)

4. At the completion of the activity, have your students construct their own single-bar bar graphs using the statistics on corn listed below. Graph paper should be used for this activity because lines are already drawn and conveniently spaced. A title, key, and horizontal numbering should be included. The rice graph may serve as a model.

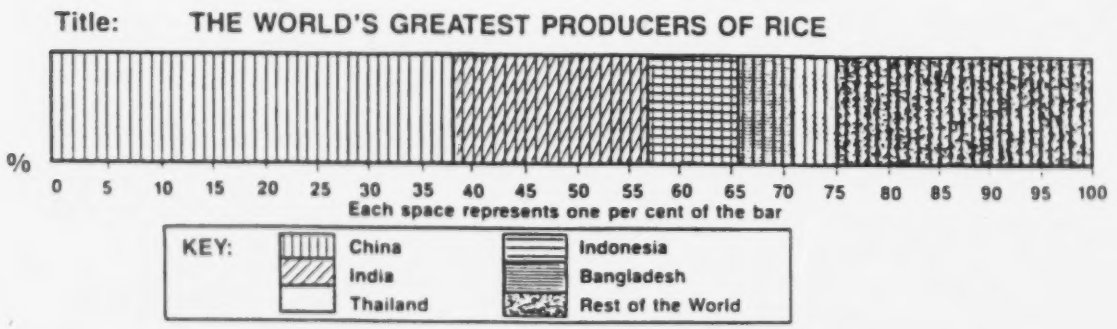
*THE WORLD'S LEADING CORN PRODUCERS**

Country	Percent
United States	47
China	14
Brazil	5
Rest of the World	34

*in a recent year

Answers to the Exercise

The facing page activity does not call for answers to questions; however, the learners' completed bar graphs should be checked for neatness and accuracy. A completed graph is shown at the bottom of this page.


Title: THE WORLD'S GREATEST PRODUCERS OF RICE
%
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Each space represents one per cent of the bar
KEY:
China
India
Thailand
Indonesia
Bangladesh
Rest of the World

Name _____ Date _____

THE WORLD'S RICE BOWLS

COUNTRY	PERCENT OF THE WORLD'S CROP
China	38
India	17
Indonesia	8
Bangladesh	5
Thailand	4
Rest of the world	28

The information in the table above can be shown in another way—with a single-bar bar graph. It is often better to show information on such a graph because comparisons may be more easily made.

Complete the graph at the bottom of the page by following the instructions.

1. The figures in the table tell a particular country's share of the world's total rice production. What percent of the world's total rice was grown in China? The table tells you that it was 38 percent.

2. Realize that the bar at the bottom of the page stands for 100 percent of all the rice produced in the world. From the left side of the bar, count off thirty-eight spaces (38 percent) on the bar. Draw a heavy line at the end of the last space.

3. Fill in China's portion of the bar with the symbol shown in the key to the graph.

4. What percent of the bar "belongs" to India? The answer is 17 percent.

Count off seventeen spaces from the end of China's portion and draw a line at the end of the last space. Fill in India's portion with symbols from the key to the graph.

5. Complete the graph with information from the table for Indonesia, Bangladesh, Thailand, and Rest of the World.

6. Think of a title for the graph and write it on the title line above the graph.

7. Make up three questions and answers that can be answered from the graph or table.

Question: _____

_____

Answer: _____

Question: _____

_____

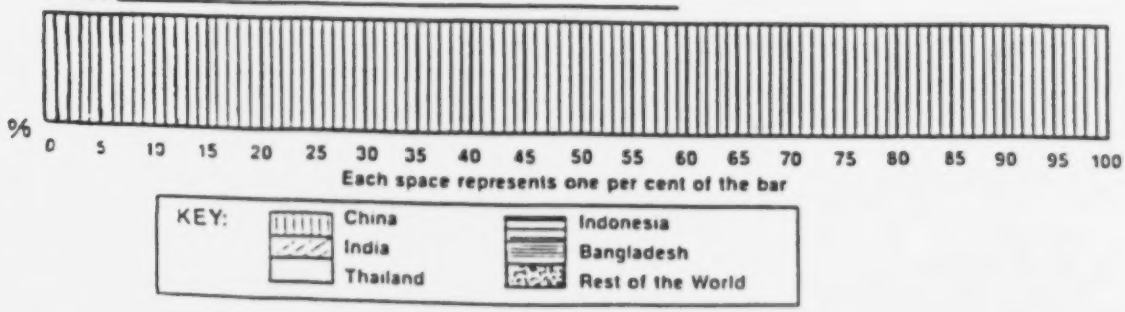
Answer: _____

Question: _____

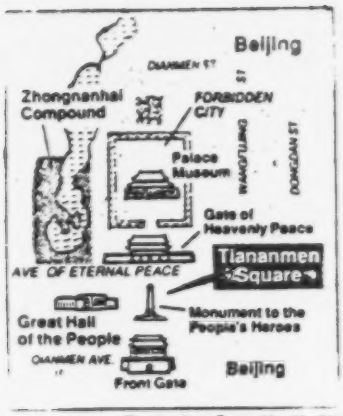
_____

Answer: _____

Title: _____


%
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Each space represents one per cent of the bar
KEY:
China
India
Thailand
Indonesia
Bangladesh
Rest of the World

Appendix B



Example of a large scale, schematic map (cartogram) from *The New York Times*, May 18, 1989 (p. 6, col. 2)

Table 1

Summary of Geographic References in the New York Times

Category	Percent
Personification of place names	10.6
Cardinal directions	3.2
Statistics	3.3
Geographical terms as part of organizational title	7.4
Datelines	2.6
Physical features	10.8
Specific geopolitical adjectives	17.4
Generic geopolitical adjectives	7.8
Specific geopolitical nouns	22.4
Generic geopolitical nouns	14.2
Maps	0.3
Total	100.0

Note. Categories are listed in the order in which they appear in the coding manual. All percents are rounded to the nearest tenth.

Table 2

Subset of Categories from *The New York Times* Analysis which Refer to Specific Place Names

Category	Percent
Personifications of place names	10.6
Geographical terms as part of organization title	7.4
Datelines	2.6
Specific geopolitcial adjectives	17.4
Specific geopolitical nouns	22.4
Total	60.4

Table 3

List of Map Symbols and Elements Found in the Maps of *The New York Times* Sample

I. Physical Entities (graphic symbols)

- river
- mountain
- lake
- relief, pictorially and stylized shading

II. Names (alpha-numeric symbols)

- river
- lake
- city
- country
- abbreviated country name

III. Conceptual symbols (graphic and alpha-numeric symbols)

- various symbols (star, circle, dot) indicating only the presence of a settlement, not its size or importance
- dotted lines to show border of a disputed area
- dotted circle to show area of special interest
- lack of compass rose, only sketchy indications of latitude or longitude
- boundaries between geopolitical units
- interstate road routes
- graphic scale
- large-scale, schematic map (cartogram) containing streets, pictures of monuments, airport (quasi-conventional map symbols showing places important to the news story)

Table 4

Summary of Geographic References in Social Studies Text Passages on the Bering Strait

	Percent						
Category	Book A	Book B	Book C	Book D	Book E	Book F	Average
Personification of place Names	0.0	10.3	0.0	0.0	0.0	1.1	1.9
Cardinal directions	3.4	3.5	1.3	6.2	2.2	5.9	3.7
Statistics	0.0	3.4	0.0	0.0	2.9	0.8	1.2
Geographical terms in organization title	0.0	0.0	0.0	0.0	0.0	0.4	0.1
Physical features	38.1	3.5	42.8	27.7	31.4	27.4	28.5
Specific geopolitical adj.	3.4	13.8	1.3	12.3	11.8	22.2	10.8
Generic geopolitical adj.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Specific geopolitical nouns	44.1	51.7	33.8	32.2	40.1	30.7	38.7
Generic geopolitical nouns	10.2	10.3	14.3	18.5	11.8	11.1	12.7
Maps	0.8	3.5	6.5	3.1	0.0	0.4	2.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note. Book G, originally part of our sample but not reported on the table, mentioned the words "Bering Strait" only one time; therefore, this textbook was not included in the summary of data.

Table 5

Comparison of Geographic References in Samples from *The New York Times* (NYT) and the Textbooks

	Percent		
Category	Textbooks	NYT/ Bering Strait	NYT/Original 5-day Sample
Place names personified	1.9	9.4	10.6
Cardinal directions	3.7	0.0	3.2
Statistics	1.2	5.2	3.3
Geographical terms as part of organization title	0.1	3.1	7.4
Datelines	NA	1.0	2.6
Physical features	28.5	11.5	10.8
Specific geopolitical adjectives	0.8	12.5	17.4
Generic geopolitical adjectives	0.0	4.2	7.8
Specific geopolitical nouns	38.7	21.9	22.4
Generic geopolitical nouns	12.7	30.2	14.2
Maps	2.4	1.0	0.3
Total	100.0	100.0	100.0

Table 6

Summary of Teacher Goal Statements from Interviews

Types of goal statements	Percent			
	Teacher 1 (2 yrs. exp.)	Teacher 2 (11 yrs. exp.)	Teacher 3 (20 yrs. exp.)	Teacher 4 (45 yrs. exp.)
General teaching goals				
Individual differences	1.8	1.5	6.6	4.2
Student interest	2.0	2.4	4.7	2.8
Structuring lessons	19.9	19.3	9.1	6.1
Nature of learners	2.3	3.4	7.3	4.1
Lesson objectives	5.3	0.5	1.4	2.6
Lesson evaluation	12.7	5.5	3.8	3.5
Planning statements	0.0	3.9	4.9	4.0
Subtotals	**44.04**	**36.5**	**37.8**	**27.3**
Geography pedagogy				
Representation tools	29.8	15.3	9.5	4.4
Vocabulary study	0.1	1.6	1.4	3.5
Comparison	0.0	6.5	4.7	3.9
Current events	0.0	0.6	0.0	3.2
Expectations for mastery	0.0	0.0	0.7	0.7
Geography axioms	0.0	0.4	2.5	0.3
Subtotals	**29.9**	**24.4**	**18.8**	**16.2**
Geography content goals				
Map study	16.9	15.3	12.1	17.3
Cultural geography	3.2	14.3	8.4	8.9
Climate zones	0.3	0.2	4.5	6.8
Vegetation	0.1	0.0	1.0	5.2
Physical geography features	1.8	0.9	5.6	11.6
Physical geography changes	0.2	0.9	0.8	1.1
Import/export: agriculture & products	1.8	2.3	6.6	1.3
Animals	0.7	0.0	2.6	0.0
Population	0.7	0.0	2.2	2.1
Regions	0.4	5.0	0.0	1.4
Subtotals	**26.1**	**38.9**	**43.8**	**55.6**
Column totals	100.0	100.0	100.0	100.0

Note. The numbers in each teacher column refer to the percent of words in each goal category out of the total goal statement words in the protocol.

Table 7

Composite List of Map Content Coverage Goals from 4 Teacher Interviews

I. Location

- A. Countries
  1. size
  2. shape
  3. where Equator goes through
  4. what countries border a particular country
- B. Current positions at particular historical moments
- C. Routes
- D. Major cities and capital cities
- E. Physical features
  1. bodies of water
     a. Indian Ocean
     b. Atlantic Ocean
     c. Arctic Ocean
     d. Antarctic Ocean
  2. landforms, i.e., volcanoes

II. Latitude and longitude

- A. Define and explain
  1. degrees
  2. projections
  3. grids
  4. how to plot specific locations
- B. Absolute location
- C. Relative location
  1. cardinal directions
  2. travel in a direction
- D. Special points and lines to know:
  1. North Pole
  2. South Pole
  3. Equator
  4. Tropic of Cancer
  5. Tropic of Capricorn
  6. Prime Meridian
- E. Travel on a route

Table 7. continued

III. Tools

- A. Maps
  - 1. benefits of map
  - 2. compass rose
- B. Globes
  - 1. hemispheres
- C. Distance
- D. Compass
- E. Atlas

IV. Student Tasks

- A. Fill in blank maps
- B. Make own maps
  - 1. of North America
  - 2. of the USA
  - 3. of regions of the USA
  - 4. with lines of longitude and latitude
- C. Using lines of longitude and latitude to answer questions
  - 1. Lots of practice

Classroom Learning and Instruction Project (CLIP)

Technical Report Series List of Reports

CLIP-89-01. Stein, M. K., Baxter, J., & Leinhardt, G. (1989). Teacher subject matter knowledge and its relationship to classroom instruction (Tech. Rep. No. CLIP-89-01). Pittsburgh, PA: University of Pittsburgh, Learning Research and Development Center.

CLIP-89-02. Grover, B. W., Zaslavsky, O., & Leinhardt, G. (1989). An approach to the design and development of a scoring system for a new teacher assessment: The semi-structured interview (Tech. Rep. No. CLIP-89-02). Pittsburgh, PA: University of Pittsburgh, Learning Research and Development Center.

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CLIP-90-05 Odoroff, E., & Leinhardt, G. (1990). Writing tales with details (Tech. Rep. No. CLIP-90-05). Pittsburgh, PA: University of Pittsburgh, Learning Research and Development Center.